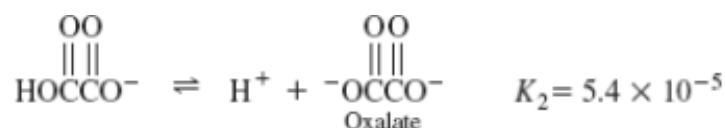
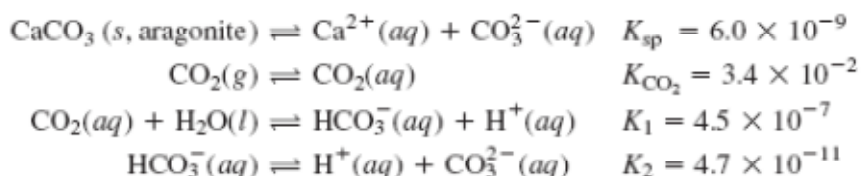


**6-51.** From the following equilibrium constants, calculate the equilibrium constant for the reaction  $\text{HO}_2\text{CCO}_2\text{H} \rightleftharpoons 2\text{H}^+ + \text{C}_2\text{O}_4^{2-}$ .



**6-53.** The planet Aragonose (which is made mostly of the mineral aragonite, whose composition is  $\text{CaCO}_3$ ) has an atmosphere containing methane and carbon dioxide, each at a pressure of 0.10 bar. The oceans are saturated with aragonite and have a concentration of  $\text{H}^+$  equal to  $1.8 \times 10^{-7}$  M. Given the following equilibria, calculate how many grams of calcium are contained in 2.00 L of Aragonose seawater.



*Don't panic!* Reverse the first reaction, add all the reactions together, and see what cancels.

**8-B.** (Without activities), calculate the pH of

(a)  $1.0 \times 10^{-8}$  M HBr

(b)  $1.0 \times 10^{-8}$  M  $\text{H}_2\text{SO}_4$  ( $\text{H}_2\text{SO}_4$  dissociates completely to  $2\text{H}^+$  plus  $\text{SO}_4^{2-}$  at this low concentration.)

**8-E.** Calculate the limiting value of the fraction of dissociation ( $\alpha$ ) of a weak acid ( $\text{p}K_a = 5.00$ ) as the concentration of HA approaches 0. Repeat the same calculation for  $\text{p}K_a = 9.00$ .

**8-3.** Calculate the pH of  $5.0 \times 10^{-8}$  M  $\text{HClO}_4$ . What fraction of the total  $\text{H}^+$  in this solution is derived from dissociation of water?

**8-8.** Find the pH and concentrations of  $(\text{CH}_3)_3\text{N}$  and  $(\text{CH}_3)_3\text{NH}^+$  in a 0.060 M solution of trimethylammonium chloride.

**8-10.** *When is a weak acid weak and when is a weak acid strong?* Show that the weak acid HA will be 92% dissociated when dissolved in water if the formal concentration is one-tenth of  $K_a$  ( $F = K_a/10$ ). Show that the fraction of dissociation is 27% when  $F = 10K_a$ . At what formal concentration will the acid be 99% dissociated? Compare your answer with the left-hand curve in Figure 8-2.

**8-14.** Using activity coefficients, find the pH and fraction of dissociation of 50.0 mM hydroxybenzene (phenol) in 0.050 M LiBr. Take the size of  $\text{C}_6\text{H}_5\text{O}^-$  to be 600 pm.

**8-15.**  $\text{Cr}^{3+}$  is acidic by virtue of the hydrolysis reaction



[Further reactions produce  $\text{Cr}(\text{OH})_2^+$ ,  $\text{Cr}(\text{OH})_3$ , and  $\text{Cr}(\text{OH})_4^-$ .] Find the value of  $K_{a1}$  in Figure 6-8. Considering only the  $K_{a1}$  reaction, find the pH of 0.010 M  $\text{Cr}(\text{ClO}_4)_3$ . What fraction of chromium is in the form  $\text{Cr}(\text{OH})^{2+}$ ?

**8-19.** Find the pH and fraction of association ( $\alpha$ ) of a 0.100 M solution of the weak base B with  $K_b = 1.00 \times 10^{-5}$ .

**8-22.** Calculate the fraction of association ( $\alpha$ ) for  $1.00 \times 10^{-1}$ ,  $1.00 \times 10^{-2}$ , and  $1.00 \times 10^{-12}$  M sodium acetate. Does  $\alpha$  increase or decrease with dilution?